

Monopolistic Competition and Oligopoly

This chapter examines two market structures, monopolistic competition and oligopoly, that fall between the extremes of pure competition and pure monopoly. Both structures are important because they offer descriptions of firms and industries typically found in the U.S. economy.

Monopolistically competitive firms are prevalent because most retail establishments, such as clothing stores and restaurants, fall into the monopolistically competitive category. In such industries, there are a relatively large number of firms, so no one has a large market share, they sell differentiated products, and each has limited pricing power.

Economists use **four-firm concentration ratios** and the **Herfindahl index** to measure the degree of firm dominance of an industry and to determine whether an industry is monopolistically competitive or oligopolistic.

The first part of the chapter focuses on the **demand curve** for the monopolistically competitive firm. This demand curve differs from those found in pure competition and pure monopoly. As the individual firm changes the character of its product, or changes product promotion, both the costs of the firm and the demand for its product will change.

The **price-output** analysis of the monopolistic competitor is relatively simple. In the short run, this analysis is identical with the analysis of the price-output decision of a pure monopolist. Only in the long run does the competitive element make itself apparent: The entry of firms forces the price a firm charges to fall. This price, however, is not equal either to minimum average cost or to marginal cost; consequently, monopolistic competition can be said to be less efficient than pure competition.

This chapter also discusses **product variety** under monopolistic competition. A part of the competitive effort of individual firms is devoted to product differentiation, product development, and advertising. Each firm has three things to manipulate—price, product, and advertising—in maximizing profits. Although monopolistic competition has been characterized as inefficient, some of the positive benefits of product variety may offset some of the inefficiencies of this market structure.

The concept of **oligopoly** is fairly easy to grasp: a few firms that are mutually interdependent dominate the market for a product. The underlying causes of oligopoly are economies of scales and barriers to entry. More difficult to grasp is oligopoly behavior. **Game theory** helps explain what is meant by mutual interdependence and why it exists in an oligopoly. It also explains why specific conclusions cannot be drawn about the price and output decisions of individual firms. Oligopolists are loath to engage in price competition because of **mutual interdependence**, and frequently resort to **collusion**

to set prices and sometimes use nonprice competition to determine market share. Collusion, however, does not give firms complete protection from competition because there are incentives to cheat on collusive agreements.

There is no standard model of oligopoly because of the diversity of markets and the uncertainty caused by mutual interdependence among firms. **Three oligopoly models**, however, cover the range of most market situations. The **kinked-demand curve** explains why, in the absence of collusion, oligopolists will not raise or lower their prices even when their costs change. This model does not explain what price oligopolists will set; it only explains why prices will be relatively inflexible.

The second model examines how oligopolists resort to **collusion** to set price. The collusion can be **overt**, as in a cartel agreement, or the collusion can be **covert**, as in a secret agreement. The OPEC oil cartel is a classic example of covert collusion. Obstacles, such as cheating on price, make collusive agreements difficult to establish and maintain.

The third model of oligopoly is **price leadership**. In some industries a dominant firm serves as the price leader for other firms. There is no overt collusion, only unwritten, informal (tacit) understandings about price and competition among firms. This model explains why there are infrequent price changes, why the lead firm makes price and output announcements for other firms to follow, and why low pricing is used to prevent new entry. Such covert collusion, however, can be undermined by price wars.

The next-to-last section of the chapter looks at **advertising** in oligopoly. Product development and advertising are often the means of competition in oligopoly. Drawing conclusions about the effects of advertising, however, is difficult. Reasonable arguments can be made that advertising is both beneficial and costly for consumers and about whether advertising helps or hurts economic efficiency.

Compared with pure competition, oligopoly does not result in allocative or productive efficiency. Nevertheless, the qualifications noted at the end of the chapter may offset some of oligopoly's shortcomings.

■ CHECKLIST

When you have studied this chapter you should be able to

- ☐ Describe monopolistic competition in terms of the number of sellers, type of product, entry and exit conditions, and advertising.

- ☐ Cite three consequences from having relatively large numbers of sellers in monopolistic competition.
- ☐ Describe five aspects of differentiated products in monopolistic competition.
- ☐ Describe the entry and exit conditions in monopolistic competition.
- ☐ State the role of advertising and nonprice competition in monopolistic competition.
- ☐ Define four-firm concentration ratio and use it to describe whether industries are monopolistically competitive or oligopolistic.
- ☐ Define the Herfindahl index and use it to assess influence of dominant firms in different types of industries.
- ☐ Compare the firm's demand curve under monopolistic competition with firms' demand curves in pure competition and pure monopoly.
- ☐ Determine the output of and the price charged by a monopolistic competitor in the short run when given cost and demand data.
- ☐ Explain why the price charged by a monopolistic competitor will in the long run tend to equal average cost and result in only a normal profit.
- ☐ Cite two real-world complications that may affect the outcome for monopolistically competitive firms in the long run.
- ☐ Show graphically how the typical firm in monopolistic competition achieves neither productive nor allocative efficiency and how excess capacity occurs.
- ☐ Discuss the effects of product variety in monopolistic competition.
- ☐ Explain why monopolistic competition is more complex in practice.
- ☐ Define oligopoly in terms of the number of producers, type of product, control over price, and interdependence.
- ☐ Explain how entry-barriers and mergers contribute to the existence of oligopolies.
- ☐ Use game theory to explain three characteristics of oligopoly behavior.
- ☐ Cite two reasons why there is no standard model of oligopoly.
- ☐ Use the kinked-demand theory to explain the tendency for prices to be inflexible in a noncollusive model oligopoly.
- ☐ Describe the price and output conditions for a cartel or collusive pricing model of oligopoly.
- ☐ Give real examples of overt and covert collusion.
- ☐ State six obstacles to collusion.
- ☐ Describe the price leadership model of oligopoly and its outcomes.
- ☐ Explain why advertising is often heavily used in oligopoly.
- ☐ Cite the potential positive and negative effects of advertising.
- ☐ Compare economic efficiency in oligopoly to other market structures.
- ☐ Describe the major demand and supply factors over the years that turned the beer industry into an oligopoly (Last Word).

■ CHAPTER OUTLINE

1. **Monopolistic competition** has several defining characteristics.

- a. The *relatively large number of sellers* means that each has a small market share, there is no collusion, and firms take actions that are independent of each other.
- b. Monopolistic competition exhibits **product differentiation**. This differentiation occurs through: differences in attributes or features of products; services to customers; location and accessibility; brand names and packaging; and some control over price.
- c. *Entry* into the industry or *exit* is relatively easy.
- d. There is **nonprice competition** in the form of product differentiation and advertising.
- e. Monopolistically competitive firms are common, and examples include asphalt paving, quick printing, saw mills, retail bakeries, clothing stores, restaurants, and grocery stores (see Table 11.1). (An explanation of how all industries are classified based on market type or market power is provided in section 5.g. of this chapter outline.)

2. Given the products produced in a monopolistically competitive industry and the amounts of promotional activity, it is possible to analyze the **price and output decisions** of a firm.

- a. The **demand curve** confronting each firm will be highly but not perfectly price elastic because each firm has many competitors who produce close but not perfect substitutes for the product it produces.
 - (1) Comparing the demand curve for the monopolistic competitor to other market structures suggests that it is not perfectly elastic, as is the case with the pure competitor, but it is also more elastic than the demand curve of the pure monopolist.
 - (2) The degree of elasticity, however, for each monopolistic competitor will depend on the number of rivals and the extent of product differentiation.
- b. In the **short run** the individual firm will produce the output at which marginal cost and marginal revenue are equal and charge the price at which the output can be sold; either economic profits or losses may result in the short run.
- c. In the **long run** the entry and exodus of firms will tend to change the demand for the product of the individual firm in such a way that economic profits are eliminated and there are only normal profits. (Price and average costs are made equal to each other.)

3. Monopolistic competition among firms producing a given product and engaged in a given amount of promotional activity results in **less economic efficiency and more excess capacity** than does pure competition.

- a. The average cost of each firm is equal in the long run to its price. The industry **does not achieve allocative efficiency** because output is smaller than the output at which marginal cost and price are equal. The industry **does not achieve productive efficiency** because the output is less than the output at which average cost is a minimum.
- b. **Excess capacity** results because firms produce less output than at the minimum of average total cost. In monopolistic competition, many firms operate below optimal capacity.

4. Each monopolistically competitive firm attempts to differentiate its product and advertise it to increase the firm's profit. These activities give rise to **nonprice competition** among firms.

a. The benefit of product variety is that firms offer consumers a wide range of types, style, brands, and quality variants of a product. Products can also be improved. The expanded range of consumer choice from product differentiation and improvement may offset some of the economic inefficiency (excess capacity problem) of monopolistic competition.

b. Monopolistic competition is more complex than the simple model presented in the chapter because the firm must constantly juggle three factors—price, product characteristics, and advertising—in seeking to maximize profits.

5. **Oligopoly** is frequently encountered in the U.S. economy.

a. It is composed of a few firms that dominate an industry.

b. It can be a **homogeneous oligopoly** that produces standardized industrial products such as steel, or a **differentiated oligopoly** that produces different types of consumer products such as automobiles.

c. Firms have control over price, and thus are price makers. Oligopolistic firms engage in **strategic behavior**, which means they take into account the actions of other firms in making their decisions. **Mutual interdependence** exists because firms must consider the reaction of rivals to any change in price, output, product characteristic, or advertising.

d. Barriers to entry, such as economies of scale or ownership, control over raw materials, patents, and pricing strategies, can explain the existence of oligopoly.

e. Some industries have become oligopolistic not from internal growth but from external factors such as mergers.

f. Most large industries are oligopolistic. They include ones such as primary copper, electric light bulbs, petrochemicals, motor vehicles, tires, and breakfast cereals (see Table 11.2).

g. The degree of concentration or market power in an industry is measured in several ways. A **four-firm concentration ratio** gives the percentage of an industry's total sales provided by the four largest firms. If the ratio is very small, the industry is competitive. If the ratio is less than 40 percent, but not very small, the industry is considered monopolistically competitive. If the ratio is 40 percent or greater, the industry is classified as oligopolistic. There are, however, shortcomings with concentration ratios:

(1) The ratio may understate concentration if markets are more local than national because the ratio is based on national data.

(2) The ratio may overstate concentration because definitions of industries can be somewhat arbitrary and there may be substantial **interindustry competition**.

(3) The ratio may overstate concentration if there is **import competition** because the ratio does not account for world trade.

(4) The ratio may understate concentration if there is a dominant firm or firms among the firms in an industry. The

Herfindahl index addresses the dominant firm problem because it accounts for the market share of each firm. It is the sum of the squared percentage market shares of all firms in the industry. This formula gives a greater weight in the index to larger firms in an industry.

6. Insight into the pricing behavior of oligopolists can be gained by thinking of the oligopoly as a game of strategy. This **game-theory model** leads to three conclusions.

a. Firms in an oligopolistic industry are mutually interdependent and must consider the actions of rivals when they make price decisions.

b. Oligopoly often leads to overt or covert collusion among the firms to fix prices or to coordinate pricing because competition among oligopolists results in low prices and profits; collusion helps maintain higher prices and profits.

c. Collusion creates incentives to cheat among oligopolists by lowering prices or increasing production to obtain more profit.

7. Economic analysis of oligopoly is difficult because of the diversity among the firms and complications resulting from mutual interdependence. Nevertheless, two important characteristics of oligopoly are inflexible prices and simultaneous price changes by firms. An analysis of three oligopoly models helps explain the pricing practices of oligopolists.

a. In the **kinked-demand model** there is no collusion. Each firm believes that if it lowers its price its rivals will lower their prices, but if it raises its price its rivals *will not* increase their prices. Therefore the firm is reluctant to change its price for fear of reducing its profits. The model has two shortcomings: it does not explain how the going price gets set; prices are not as rigid as the model implies.

b. Mutual interdependence indicates there is **collusion** among oligopoly firms to maintain or increase profits.

(1) Firms that collude tend to set their prices and joint output at the same level a pure monopolist would set them.

(2) Collusion may be overt, as in a **cartel** agreement. The OPEC cartel is an example of effective overt collusion.

(3) Collusion may be covert whereby agreements or unwritten, informal (tacit) understandings between firms set price or market share. Examples of such collusion have included bid rigging on milk prices for schools or fixing worldwide prices for a livestock feed additive.

(4) At least six obstacles make it difficult for firms to collude or maintain collusive arrangements: difference in demand and cost among firms, the number of firms in the arrangement, incentives to cheat, changing economic conditions, potential for entry by other firms, and legal restrictions and penalties.

c. **Price leadership** is a form of covert collusion in which one firm initiates price changes and the other firms in the industry follow the lead. Three price leadership tactics have been observed.

(1) Price adjustments tend to be made infrequently, only when cost and demand conditions change to a significant degree.

(2) The price leader announces the price change in various ways, through speeches, announcements, or other such activities.

(3) The price set may not maximize short-run profits for the industry, especially if the industry wants to prevent entry by other firms.

(4) Price leadership can break down and result in a **price war**. Eventually the wars end, and a price leader re-emerges.

8. Oligopolistic firms often avoid price competition but engage in **product development and advertising** for two reasons: Price cuts are easily duplicated, but nonprice competition is more unique; and firms have more financial resources for advertising and product development.

a. The potential positive effects of advertising include providing low-cost information to consumers that reduces search time and monopoly power, thus enhancing economic efficiency.

b. The potential negative effects of advertising include manipulating consumers to pay higher prices, serving as a barrier to entry into an industry, and offsetting campaigns that raise product costs and prices.

9. The **efficiency of oligopoly** is difficult to evaluate.

a. Many economists think that oligopoly price and output characteristics are similar to those of monopoly. Oligopoly firms set output where price exceeds marginal cost and the minimum of average total cost. Oligopoly is allocatively inefficient ($P > MC$) and productively inefficient ($P > \text{minimum ATC}$).

b. This view must be qualified because of increased foreign competition to oligopolistic firms, the use of limit pricing that sets prices at less than the profit-maximizing price, and the technological advances arising from this market structure.

10. (Last Word). In 1947, there were over 400 independent brewers in the United States, but today the two major brewers account for 76 percent of the market. One reason for this change is that demand changed. Preferences shifted from stronger-flavored beers to lighter, dryer products. Consumption also shifted from taverns to homes; which results in different packaging. On the supply side, technology changed to produce significant economies of scale that now are barriers to entry. Mergers have occurred, but they are not the fundamental cause of increased concentration. Advertising and product differentiation have also been important in the growth of some firms.

■ HINTS AND TIPS

1. Review the four basic market models in Table 9.1 so that you see how monopolistic competition and oligopoly compare with the other market models on five characteristics.

2. The same $MC = MR$ rule for maximizing profits or minimizing losses for the firm from previous chapters is now used to determine output and price in monopolistic competition and in certain oligopoly models. If you understood how the rule applied under pure competition and pure monopoly, you should have no trouble applying it here.

3. Make sure you know how to interpret Figure 11.1 because it is an important graph. It illustrates why a representative firm in monopolistic competition just breaks even in the long run, and earns just a normal rather than an economic profit. It also shows how economic inefficiency in monopolistic competition produces excess capacity.

4. Where is the kink in the kinked-demand model? To find out, practice drawing the model. Then use Figure 11.4 to check your answer. Explain to yourself what each line means in the graph.

5. Price and output determinations under collusive oligopoly or a cartel are essentially the same as those for pure monopoly.

■ IMPORTANT TERMS

monopolistic competition	strategic behavior
product differentiation	mutual interdependence
nonprice competition	interindustry competition
four-firm concentration ratio	import competition
Herfindahl index	game theory
excess capacity	collusion
oligopoly	kinked-demand curve
homogeneous oligopoly	price war
differentiated oligopoly	cartel
	price leadership

SELF-TEST

■ FILL-IN QUESTIONS

1. In a monopolistically competitive market, there are a relatively (large, small) _____ number of producers who sell (standardized, differentiated) _____ products. Entry into such a market is relatively (difficult, easy) _____. The number of firms means that each one has a (large, small) _____ market share, the firms (do, do not) _____ collude, and they operate in (an independent, a dependent) _____ manner.

2. Identify the different aspects of production differentiation in monopolistic competition:

- _____
- _____
- _____
- _____
- _____

3. In the *short run* for a monopolistically competitive firm,

- the demand curve will be (more, less) _____

elastic than that facing a monopolist and _____
 elastic than that facing a pure competitor;
 b. the elasticity of this demand curve will depend on

- (1) _____ and
 (2) _____; and

c. it will produce the output level where marginal cost is (less than, equal to, greater than) _____ marginal revenue.

4. In the *long run* for a monopolistically competitive industry,

- a. the *entry* of new firms will (increase, decrease) _____ the demand for the product produced by each firm in the industry and _____ the elasticity of that demand.
 b. the price charged by the individual firm will tend to equal (average, marginal) _____ cost, its economic profits will tend to be (positive, zero) _____, and its average cost will be (greater, less) _____ than the minimum average cost of producing and promoting the product.

5. Although representative firms in monopolistic competition tend to earn (economic, normal) _____ profits in the long run, there can be complications that may result in firms earning _____ profits in the long run. Some firms may achieve a degree of product differentiation that (can, cannot) _____ be duplicated by other firms. There may be (collusion, barriers to entry) _____ that prevent penetration of the market by other firms.

6. In monopolistic competition, price is (less than, equal to, greater than) _____ marginal cost, and so the market structure (does, does not) _____ yield allocative efficiency. Also, average total cost is (less than, equal to, greater than) _____ the minimum of average total cost, and so the market structure (does, does not) _____ result in (allocative, productive) _____ efficiency.

7. In the long run, the monopolistic competitor tries to earn economic profits by using (price, nonprice) _____ competition in the form of product differentiation and advertising. This results in a trade-off between a choice of more consumer goods and services and (more, less) _____ economic efficiency.

8. The more complex model of monopolistic competition suggests that in seeking to maximize profits, each firm juggles the factors of (losses, price) _____, changes in (collusion, product _____, and decisions about

(controls, advertising) _____ until the firm feels no further change in the variables will result in greater profit.

9. The percentage of the total industry sales accounted for by the top four firms in an industry is known as a four-firm (Herfindahl index, concentration ratio) _____, whereas summing the squared percentage market shares of each firm in the industry is the way to calculate the _____.

10. In an oligopoly (many, a few) _____ large firms produce either a differentiated or a (heterogeneous, homogeneous) _____ product, and entry into such an industry is (easy, difficult) _____. The oligopolistic firm is a price (maker, taker) _____ and there is mutual (independence, interdependence) _____ among firms in an industry. The existence of oligopoly can be explained by (exit, entry) _____ barriers and by (markets, mergers) _____.

11. The basics of the pricing behavior of oligopolists can be understood from a (game, advertising) _____ theory perspective. Oligopoly consists of a few firms that are mutually (funded, interdependent) _____. This means that when setting the price of its product, each producer (does, does not) _____ consider the reaction of its rivals. The monopolist (does, does not) _____ face this problem because it has no rivals, and the pure competitor, or monopolistic competitor, _____ face the problem because it has many rivals.

12. It is difficult to use formal economic analysis to explain the prices and outputs of oligopolists because oligopoly encompasses (diverse, similar) _____ market situation(s), and when firms are mutually interdependent, each firm is (certain, uncertain) _____ about how its rivals will react when it changes the price of its product. Despite the analytical problems, oligopoly prices tend to be (flexible, inflexible) _____ and oligopolists tend to change their prices (independently, together) _____.

13. The noncolluding oligopolist has a kinked-demand curve that

- a. is highly (elastic, inelastic) _____ at prices above the current or going price and tends to be only slightly _____ or (elastic, inelastic) _____ below that price.
 b. is drawn on the assumption that if the oligopolist raises its price its rivals (will, will not) _____

raise their prices or if it lowers its price its rivals _____ lower their prices.

c. has an associated marginal (cost, revenue) _____ curve with a gap, such that small changes in the marginal _____ curve do not change the price the oligopolist will charge.

14. A situation in which firms in an industry reach an agreement to fix prices, divide up the market, or otherwise restrict competition among themselves is called (concentration, collusion) _____. In this case, the prices they set and their combined output tend to be the same as that found with pure (competition, monopoly) _____.

15. A formal written agreement among sellers in which the price and the total output of the product and each seller's share of the market are specified is a (cartel, duopoly) _____. It is a form of (covert, overt) _____ collusion, whereas tacit understandings among firms to divide up a market would be _____ collusion.

16. Six obstacles to collusion among oligopolists are

- _____
- _____
- _____
- _____
- _____
- _____

17. When one firm in an oligopoly is almost always the first to change its price and the other firms change their prices after the first firm has changed its price, the oligopoly model is called the (price war, price leadership) _____

_____ model. The tactics of this model include (infrequent, frequent) _____ price changes, announcements of such price changes, and (limit, no limit) _____ pricing.

One event that can undermine this practice is (price leadership, price wars) _____.

18. There tends to be very little (price, nonprice) _____ competition among oligopolists and a great deal of _____ competition such as product development and advertising used to determine each firm's share of the market.

a. The positive view of advertising contends that it is (efficient, inefficient) _____ because it provides important information that (increases, reduces) _____ search costs, and information about competing goods _____ monopoly power.

b. The negative view of advertising suggests that it is (inefficient, efficient) _____ because the advertising campaigns are (offsetting, reinforcing) _____, the creation of brand loyalty serves as

a barrier to (entry, exit) _____, and consumers are persuaded to pay (lower, higher) _____ prices than they would have paid otherwise.

19. Although it is difficult to evaluate the economic efficiency of oligopoly, when comparisons are made to pure competition, the conclusion drawn is that oligopoly (is, is not) _____ allocatively efficient and (is, is not) _____ productively efficient. The price and output behavior of the oligopolist is more likely to be similar to that found under (competition, monopoly) _____.

20. The view that oligopoly is inefficient in the short run needs to be qualified because of the effects of (decreased, increased) _____ foreign competition that make pricing more competitive, policies to restrict entry into an industry that keep consumer prices (high, low) _____, and profits that are used to fund (more, less) _____ research and development that produces improved products.

■ TRUE-FALSE QUESTIONS

Circle T if the statement is true, F if it is false.

- Monopolistic competitors have no control over the price of their products. T F
- The firm's reputation for servicing or exchanging its product is a form of product differentiation under monopolistic competition. T F
- Entry is relatively easy in pure competition, but there are significant barriers to entry in monopolistic competition. T F
- The smaller the number of firms in an industry and the greater the extent of product differentiation, the greater will be the elasticity of the individual seller's demand curve. T F
- The demand curve of the monopolistic competitor is likely to be less elastic than the demand curve of the pure monopolist. T F
- In the short run, firms that are monopolistically competitive may earn economic profits or incur losses. T F
- The long-run equilibrium position in monopolistic competition would be where price is equal to marginal cost. T F
- Representative firms in a monopolistically competitive market earn economic profits in the long run. T F
- One reason why monopolistic competition is economically inefficient is that the average cost of producing the product is greater than the minimum average cost at which the product could be produced. T F
- The more product variety offered to consumers by a monopolistically competitive industry, the less excess capacity there will be in that industry. T F

11. Successful product improvement by one firm has little or no effect on other firms under monopolistic competition. T F

12. The products produced by the firms in an oligopolistic industry may be either homogeneous or differentiated. T F

13. Oligopolistic industries contain a few large firms that act independently of one another. T F

14. Concentration ratios include adjustments for interindustry competition in measuring concentration in an industry. T F

15. The Herfindahl index is the sum of the market shares of all firms in the industry. T F

16. Game theory analysis of oligopolist behavior suggests that oligopolists will not find any benefit in collusion. T F

17. One shortcoming of kinked-demand analysis is that it does not explain how the going oligopoly price was established in the first place. T F

18. Collusion occurs when firms in an industry reach an overt or covert agreement to fix prices, divide or share the market, and in some way restrict competition among the firms. T F

19. A cartel is usually a written agreement among firms which sets the price of the product and determines each firm's share of the market. T F

20. Secret price concessions and other forms of cheating will strengthen collusion. T F

21. The practice of price leadership is almost always based on a formal written or oral agreement. T F

22. Limit pricing is the leadership tactic of limiting price increases to a certain percentage of the basic price of a product. T F

23. Those contending that advertising contributes to monopoly power argue that the advertising by established firms creates barriers to the entry of new firms into an industry. T F

24. Oligopolies are allocatively and productively efficient when compared with the standard set in pure competition. T F

25. Increased competition from foreign firms in oligopolistic industries has stimulated more competitive pricing in those industries. T F

■ MULTIPLE-CHOICE QUESTIONS

Circle the letter that corresponds to the best answer.

1. Which would be most characteristic of monopolistic competition?

- (a) collusion among firms
- (b) firms selling a homogeneous product
- (c) a relatively large number of firms
- (d) difficult entry into and exit from the industry

2. The concern that monopolistically competitive firms express about product attributes, services to customers, or brand names are aspects of

- (a) allocative efficiency in the industry
- (b) collusion in the industry
- (c) product differentiation
- (d) concentration ratios

3. The demand curve a monopolistically competitive firm faces is

- (a) perfectly elastic
- (b) perfectly inelastic
- (c) highly, but not perfectly inelastic
- (d) highly, but not perfectly elastic

4. In the short run, a typical monopolistically competitive firm will earn

- (a) only a normal profit
- (b) only an economic profit
- (c) only an economic or normal profit
- (d) an economic or normal profit or suffer an economic loss

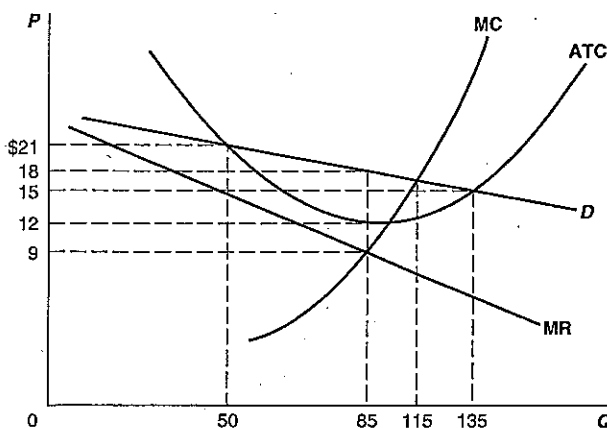
5. A monopolistically competitive firm is producing at an output level in the short run where average total cost is \$3.50, price is \$3.00, marginal revenue is \$1.50, and marginal cost is \$1.50. This firm is operating

- (a) with an economic loss in the short run
- (b) with an economic profit in the short run
- (c) at the break-even level of output in the short run
- (d) at an inefficient level of output in the short run

6. If firms enter a monopolistically competitive industry, we would expect the typical firm's demand curve to

- (a) increase and the firm's price to increase
- (b) decrease and the firm's price to decrease
- (c) remain the same but the firm's price to increase
- (d) remain the same and the firm's price to remain the same

Answer Questions 7, 8, 9, and 10 on the basis of the following diagram for a monopolistically competitive firm in short-run equilibrium.



7. The firm's profit-maximizing price will be
 (a) \$9
 (b) \$12
 (c) \$15
 (d) \$18
8. The equilibrium output for this firm will be
 (a) 50
 (b) 85
 (c) 115
 (d) 135
9. This firm will earn an economic profit of
 (a) \$510
 (b) \$765
 (c) \$1021
 (d) \$1170
10. If firms enter this industry in the long run,
 (a) demand will decrease
 (b) demand will increase
 (c) the marginal revenue curve will shift upward
 (d) economic profits will increase
11. Given a representative firm in a typical monopolistically competitive industry, in the long run
 (a) the firm will produce that output at which marginal cost and price are equal
 (b) the elasticity of demand for the firm's product will be less than it was in the short run
 (c) the number of competitors the firm faces will be greater than it was in the short run
 (d) the economic profits being earned by the firm will tend to equal zero
12. Productive efficiency is not achieved in monopolistic competition because production occurs where
 (a) MR is greater than MC
 (b) MR is less than MC
 (c) ATC is greater than minimum ATC
 (d) ATC is less than MR and greater than MC
13. The *underallocation* of resources in monopolistic competition means that at the profit-maximizing level of output, price is
 (a) greater than MC
 (b) less than MC
 (c) less than MR
 (d) greater than minimum ATC
14. Excess capacity occurs in a monopolistically competitive industry because firms
 (a) advertise and promote their product
 (b) charge a price that is less than marginal cost
 (c) produce at an output level short of the least-cost output
 (d) have a perfectly elastic demand for the products that they produce
15. Were a monopolistically competitive industry in long-run equilibrium, a firm in that industry might be able to increase its economic profits by
 (a) increasing the price of its product
 (b) increasing the amounts it spends to advertise its product
 (c) decreasing the price of its product
 (d) decreasing the output of its product
16. Which would be most characteristic of oligopoly?
 (a) easy entry into the industry
 (b) a few large producers
 (c) product standardization
 (d) no control over price
17. Mutual interdependence means that
 (a) each firm produces a product similar but not identical to the products produced by its rivals
 (b) each firm produces a product identical to the products produced by its rivals
 (c) each firm must consider the reactions of its rivals when it determines its price policy
 (d) each firm faces a perfectly elastic demand for its product
18. One major problem with concentration ratios is that they fail to take into account
 (a) the national market for products
 (b) competition from imported products
 (c) excess capacity in production
 (d) mutual interdependence
19. Industry A is composed of four large firms that hold market shares of 40, 30, 20, and 10. The Herfindahl index for this industry is
 (a) 100
 (b) 1000
 (c) 3000
 (d) 4500

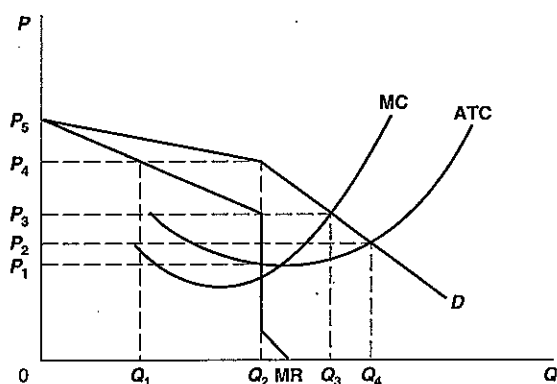
Questions 20, 21, and 22 are based on the following payoff matrix for a duopoly in which the numbers indicate the profit in thousands of dollars for a high-price or a low-price strategy.

		Firm A Strategy	
		High-price	Low-price
Firm B Strategy	High-price	A = \$425 B = \$425	A = \$525 B = \$275
	Low-price	A = \$275 B = \$525	A = \$300 B = \$300

20. If both firms collude to maximize joint profits, the total profits for the two firms will be
 (a) \$400,000
 (b) \$800,000
 (c) \$850,000
 (d) \$950,000
21. Assume that Firm B adopts a low-price strategy while Firm A maintains a high-price strategy. Compared to the results from a high-price strategy for both firms, Firm B will now
 (a) lose \$150,000 in profit and Firm A will gain \$150,000 in profit
 (b) gain \$100,000 in profit and Firm A will lose \$150,000 in profit

- (c) gain \$150,000 in profit and Firm A will lose \$100,000 in profit
 (d) gain \$525,000 in profit and Firm A will lose \$275,000 in profit
22. If both firms operate independently and do not collude, the most likely profit is
 (a) \$300,000 for Firm A and \$300,000 for Firm B
 (b) \$525,000 for Firm A and \$275,000 for Firm B
 (c) \$275,000 for Firm A and \$525,000 for Firm B
 (d) \$425,000 for Firm A and \$425,000 for Firm B
23. If an individual oligopolist's demand curve is kinked, it is necessarily
 (a) perfectly elastic at the going price
 (b) less elastic above the going price than below it
 (c) more elastic above the going price than below it
 (d) of unitary elasticity at the going price

Use the following diagram to answer Question 24.



24. The profit-maximizing price and output for this oligopolistic firm is
 (a) P_5 and Q_2
 (b) P_4 and Q_2
 (c) P_3 and Q_3
 (d) P_2 and Q_4
25. What is the situation called whenever firms in an industry reach an agreement to fix prices, divide up the market, or otherwise restrict competition?
 (a) interindustry competition
 (b) incentive to cheat
 (c) price leadership
 (d) collusion
26. When oligopolists collude the results are generally
 (a) greater output and higher price
 (b) greater output and lower price
 (c) smaller output and lower price
 (d) smaller output and higher price
27. To be successful, collusion requires that oligopolists be able to
 (a) keep prices and profits as low as possible
 (b) block or restrict the entry of new producers
 (c) reduce legal obstacles that protect market power
 (d) keep the domestic economy from experiencing high inflation

28. Which is a typical tactic that has been used by the price leader in the price leadership model of oligopoly?
 (a) limit pricing
 (b) frequent price changes
 (c) starting a price war with competitors
 (d) giving no announcement of a price change
29. Market shares in oligopoly are typically determined on the basis of
 (a) product development and advertising
 (b) covert collusion and cartels
 (c) tacit understandings
 (d) joint profit maximization
30. Many economists think that relative to pure competition, oligopoly is
 (a) allocatively efficient, but not productively efficient
 (b) productively efficient, but not allocatively efficient
 (c) both allocatively and productively efficient
 (d) neither allocatively nor productively efficient

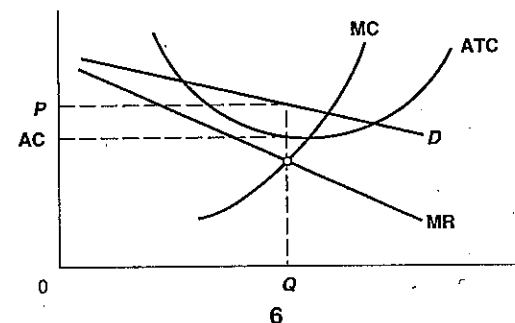
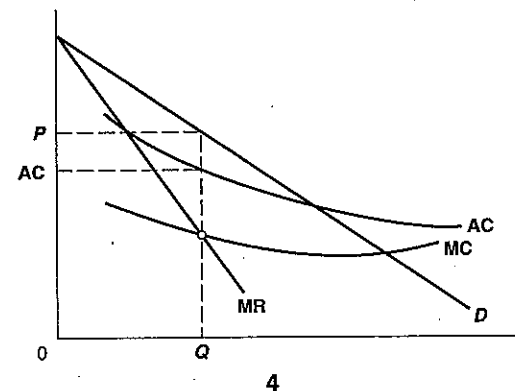
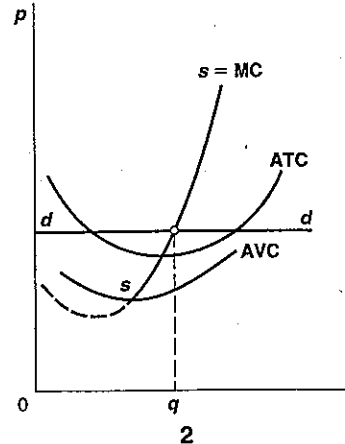
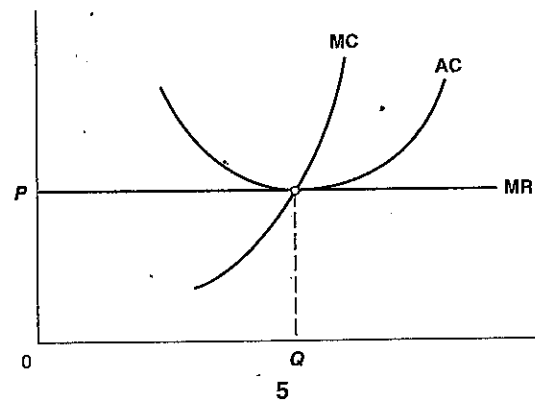
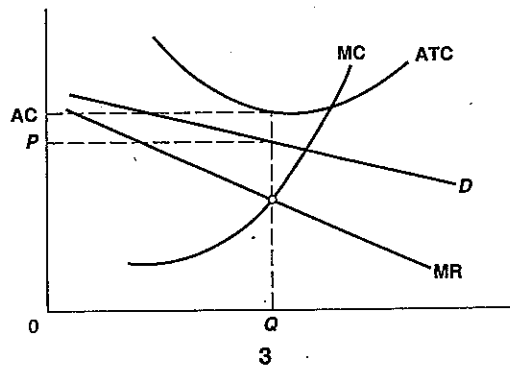
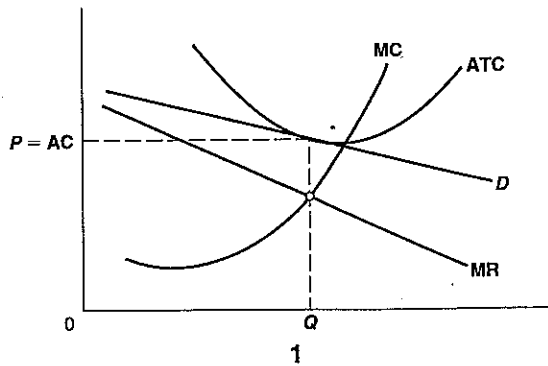
PROBLEMS

1. Assume that the short-run cost and demand data given in the following table confront a monopolistic competitor selling a given product and engaged in a given amount of product promotion.

Output	Total cost	Marginal cost	Quantity demanded	Price	Marginal revenue
0	\$ 50		0	\$120	
1	80	\$_____	1	110	\$_____
2	90	_____	2	100	_____
3	110	_____	3	90	_____
4	140	_____	4	80	_____
5	180	_____	5	70	_____
6	230	_____	6	60	_____
7	290	_____	7	50	_____
8	360	_____	8	40	_____
9	440	_____	9	30	_____
10	530	_____	10	20	_____

- a. Compute the marginal cost and marginal revenue of each unit of output and enter these figures in the table.
- b. In the short run the firm will (1) produce _____ units of output, (2) sell its output at a price of \$_____, and (3) have a total economic profit of \$_____.
- c. In the long run, (1) the demand for the firm's product will _____, (2) until the price of the product equals _____, and (3) the total economic profits of the firm are _____.

2. Match the following descriptions to the six graphs on the next page. Indicate on each graph the area of economic profit or loss or state if the firm is just making normal profits.



a. a purely competitive firm earning economic profits in the short run Graph _____

b. a purely competitive firm in long-run equilibrium Graph _____

c. a natural monopoly Graph _____

d. a monopolistically competitive firm earning economic profits in the short run Graph _____

e. a monopolistically competitive firm experiencing economic losses in the short run Graph _____

f. a monopolistically competitive firm in long-run equilibrium Graph _____

3. Consider the following payoff matrix in which the numbers indicate the profit in millions of dollars for a duopoly based on either a high-price or a low-price strategy.

Firm X Strategy		Firm Y Strategy	
High-price	Low-price	High-price	Low-price
X = \$200	X = \$250	X = \$200	X = \$50
Y = \$200	Y = \$50	X = \$50	X = \$50
X = \$50	X = \$50	Y = \$250	Y = \$50
Y = \$250	Y = \$50		

a. **Situation 1:** Each firm chooses a high-price strategy.

Result: Each firm will earn \$_____ million in profit for a total of \$_____ million for the two firms.

b. **Situation 2:** Firm X chooses a low-price strategy while Firm Y maintains a high-price strategy. **Result:**

Firm X will earn \$_____ million and Firm Y will earn \$_____ million. Compared to Situation 1, Firm X has an incentive to cut prices because it will earn \$_____ million more in profit and Firm Y will earn \$_____ million less in profit. Together, the

firms will earn \$_____ million in profit, which is \$_____ million less than in Situation 1.

c. Situation 3: Firm Y chooses a low-price strategy while Firm X maintains a high-price strategy. **Result:** Compared to Situation 1, Firm Y has an incentive to cut prices because it will earn \$_____ million and Firm X will earn \$_____. Compared to Situation 1, Firm Y will earn \$_____ million more in profit and Firm X will earn \$_____ million less in profit. Together, the firms will earn \$_____ million in profit, which is \$_____ less than in Situation 1.

d. Situation 4: Each firm chooses a low-price strategy. **Result:** Each firm will earn \$_____ million in profit for a total of \$_____ million for the two firms. This total is \$_____ less than in Situation 1.

e. Conclusions:

(1) The two firms have a strong incentive to collude and adopt the high-price strategy because there is the potential for \$_____ million more in profit for the two firms than with a low-price strategy (Situation 4), or the potential for \$_____ million more for the two firms than with a mixed-price strategy (Situations 2 or 3).

(2) There is also a strong incentive for each firm to cheat on the agreement and adopt a low-price strategy when the other firm maintains a high-price strategy because this situation will produce \$_____ million

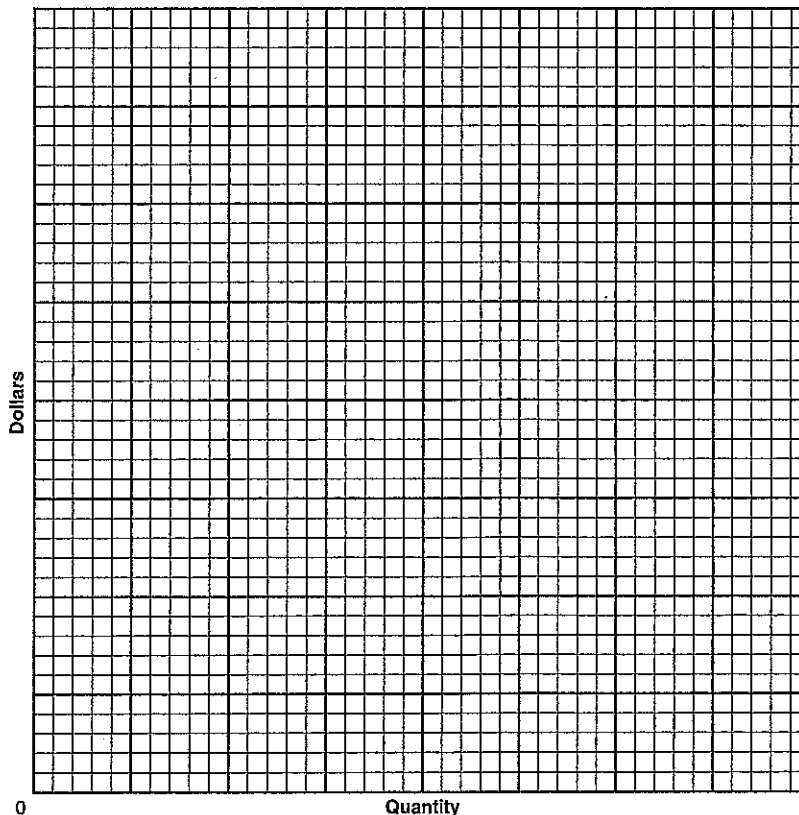
more in profit for the cheating firm compared to its honoring a collusive agreement for a high-price strategy.

4. The kinked-demand schedule which an oligopolist believes confronts the firm is presented in the following table.

Price	Quantity demanded	Total revenue	Marginal revenue per unit
\$2.90	100	\$_____	
2.80	200	_____	\$_____
2.70	300	_____	_____
2.60	400	_____	_____
2.50	500	_____	_____
2.40	525	_____	_____
2.30	550	_____	_____
2.20	575	_____	_____
2.10	600	_____	_____

- Compute the oligopolist's total revenue at each of the nine prices and enter these figures in the table.
- Also compute marginal revenue for each unit between the nine prices and enter these figures in the table.
- What is the current, or going, price for the oligopolist's product? \$_____ How much is it selling? _____

d. On the graph below plot the oligopolist's demand curve and marginal revenue curve. Connect the demand points and the marginal revenue points with as straight a line as possible. (Be sure to plot the marginal revenue figures at the average of the two quantities involved, that is, at 150, 250, 350, 450, 512.5, 537.5, 562.5, and 587.5.)



e. Assume that the marginal cost schedule of the oligopolist is given in columns 1 and 2 of the following table. Plot the marginal cost curve on the graph on which demand and marginal revenue were plotted.

(1) Output	(2) MC	(3) MC'	(4) MC''
150	\$1.40	\$1.90	\$.40
250	1.30	1.80	.30
350	1.40	1.90	.40
450	1.50	2.00	.50
512.5	1.60	2.10	.60
537.5	1.70	2.20	.70
562.5	1.80	2.30	.80
587.5	1.90	2.40	.90

(1) Given demand and marginal cost, what price should the oligopolist charge to maximize profits?

\$_____ How many units of product will it sell at this price? _____

(2) If the marginal cost schedule changed from that shown in columns 1 and 2 to that shown in columns 1 and 3, what price should it charge? \$_____ What

level of output will it produce? _____ How have profits changed as a result of the change in costs?

Plot the new marginal cost curve on the graph.

(3) If the marginal-cost curve schedule changed from that shown in columns 1 and 2 to that shown in columns 1 and 4, what price should it charge? \$_____

What level of output will it produce? _____ How have profits changed as a result of the change in costs? _____ Plot the new marginal cost curve on the graph.

5. An oligopoly producing a homogeneous product is composed of three firms. Assume that these three firms have identical cost schedules. Assume also that if any one of these firms sets a price for the product, the other two firms charge the same price. As long as the firms all charge the same price they will share the market equally, and the quantity demanded of each will be the same.

Following is the total cost schedule of one of these firms and the demand schedule that confronts it when the other firms charge the same price as this firm.

Output	Total cost	Marginal cost	Price	Quantity demanded	Marginal revenue
0	\$ 0		\$140	0	
1	30	\$_____	130	1	\$_____
2	50	_____	120	2	_____
3	80	_____	110	3	_____
4	120	_____	100	4	_____
5	170	_____	90	5	_____
6	230	_____	80	6	_____
7	300	_____	70	7	_____
8	380	_____	60	8	_____

a. Complete the marginal cost and marginal revenue schedules facing the firm.

b. What price would this firm set if it wished to maximize its profits? \$_____

c. How much would

(1) it sell at this price? _____

(2) its profits be at this price? \$_____

d. What would be the industry's

(1) total output at this price? _____

(2) joint profits at this price? \$_____

e. Is there any other price this firm can set, assuming that the other two firms charge the same price, that would result in a greater joint profit for them? _____

f. If these three firms colluded in order to maximize their joint profit, what price would they charge? \$_____

■ SHORT ANSWER AND ESSAY QUESTIONS

1. What are the three characteristics of monopolistic competition?

2. What is meant by product differentiation? By what methods can products be differentiated?

3. How does product differentiation affect the kind of competition and the degree of monopoly in monopolistic competition?

4. Describe the elasticity of the demand curve faced by a monopolistically competitive firm in the short run.

5. Assume that the firm is producing a given product and is engaged in a given amount of promotional activity. What two factors determine how elastic the demand curve will be for a monopolistic competitor?

6. At what level of output will the monopolistic competitor produce in the short run? What price will it charge for its product? Draw a graph to help explain your answer.

7. What determines whether a monopolistically competitive firm will earn economic profits or suffer economic losses in the short run?

8. What will be the level of economic profit that the monopolistic competitor will tend to receive in the long run? What forces economic profits toward this level? Why is this just a *tendency*?

9. What are two complications that would explain why the representative firm may not earn only a normal profit in the long run and may earn economic profits?

10. Use the concepts of allocative and productive efficiency to explain excess capacity and the level of prices under monopolistic competition.

11. Describe the methods, other than price cutting, that a monopolistic competitor can use to protect and increase its economic profits in the long run.

12. Explain how product variety and improvement may offset the economic inefficiency associated with monopolistic competition.

13. What are the essential characteristics of an oligopoly? How does oligopoly differ from pure competition, pure monopoly, and monopolistic competition?

14. Explain how the concentration ratio in a particular industry is computed. What is the relationship between this ratio and fewness? What are the shortcomings of the concentration ratio as a measure of the extent of competition in an industry?

15. What is the Herfindahl index? How can it be used to correct problems with concentration ratios?

16. How can game theory be used to explain strategic behavior under oligopoly? What do mutual interdependence and collusion mean with respect to oligopoly?

17. Why is it difficult to use one standard model to explain the prices charged by and the outputs of oligopolists?

18. How can the kinked-demand curve be used to explain why oligopoly prices are relatively inflexible?

19. Suppose a few firms produce a homogeneous product, have identical cost curves, and charge the same price (act as a cartel). Compare the results in terms of price, combined output, and joint profits with those from a pure monopoly producing the same market output.

20. Why do oligopolists find it advantageous to collude? What are the obstacles to collusion?

21. What is the price leadership model, and what leadership tactics do oligopolistic firms use?

22. Why do oligopolists engage in little price competition and in extensive product development and advertising?

23. How is it possible for consumers to get a lower price on a product with advertising than they would in its absence?

24. Explain how the advertising efforts of firms may be offsetting and lead to higher prices for consumers.

25. Evaluate the economic efficiency of the oligopoly market structure. What qualifications should be noted for the evaluation?

9. concentration ratio, Herfindahl index
10. a few, homogeneous, difficult, maker, interdependence, entry, mergers
11. game, interdependent, does, does not, does not
12. diverse, uncertain, inflexible, together
13. a. elastic, elastic, inelastic; b. will not, will; c. revenue, cost
14. collusion, monopoly
15. cartel, overt, covert
16. a. demand and cost differences; b. a large number of firms; c. cheating (secret price cutting); d. a recession; e. potential entry; f. legal obstacles (antitrust laws) (any order for a–f)
17. price leadership, infrequent, limit, price wars
18. price, nonprice; a. efficient, reduces, reduces; b. inefficient, offsetting, entry, higher
19. is not, is not, monopoly
20. increased, low, more

TRUE-FALSE QUESTIONS

- | | |
|--------------------|--------------------|
| 1. F, pp. 223–224 | 14. F, p. 231 |
| 2. T, p. 223 | 15. F, pp. 231–232 |
| 3. F, p. 224 | 16. F, pp. 232–233 |
| 4. F, pp. 225–226 | 17. T, pp. 234–236 |
| 5. F, pp. 225–226 | 18. T, pp. 232–233 |
| 6. T, pp. 225–227 | 19. T, pp. 237–238 |
| 7. F, pp. 226–227 | 20. F, pp. 238–239 |
| 8. F, p. 227 | 21. F, p. 239 |
| 9. T, pp. 227–228 | 22. F, p. 239 |
| 10. F, pp. 228–229 | 23. T, pp. 240–241 |
| 11. F, p. 229 | 24. F, p. 241 |
| 12. T, p. 230 | 25. T, p. 241 |
| 13. F, p. 229 | |

MULTIPLE-CHOICE QUESTIONS

- | | |
|--------------------|--------------------|
| 1. c, p. 223 | 16. b, p. 229 |
| 2. c, pp. 223–224 | 17. c, p. 230 |
| 3. d, pp. 225–226 | 18. b, p. 231 |
| 4. d, pp. 225–226 | 19. c, p. 231 |
| 5. a, pp. 225–226 | 20. c, p. 232 |
| 6. b, p. 227 | 21. b, p. 232 |
| 7. d, pp. 225–226 | 22. a, pp. 232 |
| 8. b, pp. 225–226 | 23. c, pp. 234–236 |
| 9. a, pp. 225–226 | 24. b, pp. 234–236 |
| 10. a, pp. 226–227 | 25. d, pp. 232–233 |
| 11. d, pp. 225–226 | 26. d, pp. 236–237 |
| 12. c, pp. 227–228 | 27. b, p. 239 |
| 13. a, pp. 227–228 | 28. a, p. 239 |
| 14. c, p. 228 | 29. a, pp. 240–241 |
| 15. b, pp. 228–229 | 30. d, p. 241 |

ANSWERS

Chapter 11 Monopolistic Competition and Oligopoly

FILL-IN QUESTIONS

1. large, differentiated, easy, small, do not, an independent
2. a. product attributes; b. services; c. location; d. brand names and packaging; e. some control over price
3. a. more, less; b. (1) number of rivals the firm has, (2) the degree of product differentiation; c. equal to
4. a. decrease, increase; b. average, zero, greater
5. normal, economic, cannot, barriers to entry
6. greater than, does not, greater than, does not, productive
7. nonprice, more
8. price, product, advertising

PROBLEMS

1. a. Marginal cost: \$30, 10, 20, 30, 40, 50, 60, 70, 80, 90; Marginal revenue: \$110, 90, 70, 50, 30, 10, –10, –30, –50, –70; b. (1) 4, (2) \$80, (3) \$180; c. (1) decrease, (2) average cost, (3) equal to zero
2. a. 2; b. 5; c. 4; d. 6; e. 3; f. 1
3. a. 200, 400; b. 250, 50, 50, 150, 300, 100; c. 250, 50, 50, 150, 300, 100; d. 50, 100, 300; e. (1) 300, 100, (2) 50
4. a. Total revenue: 290, 560, 810, 1,040, 1,250, 1,260, 1,265, 1,265, 1,260; b. Marginal revenue: 2.70, 2.50, 2.30, 2.10, 0.40, 0.20, 0, –0.20; c. 2.50, 500; d. graph; e. (1) 2.50, 500, (2) 2.50, 500, they have decreased, (3) 2.50, 500, they have increased
5. a. Marginal cost: \$30, 20, 30, 40, 50, 60, 70, 80; Marginal revenue: \$130, 110, 90, 70, 50, 30, 10, –10; b. \$90; c. (1) 5, (2) \$280; d. (1) 15, (2) \$840; e. no; f. \$90

SHORT ANSWER AND ESSAY QUESTIONS

- | | |
|-----------------|------------------|
| 1. p. 223 | 14. pp. 224, 231 |
| 2. pp. 223-224 | 15. pp. 231-232 |
| 3. pp. 223-224 | 16. p. 232 |
| 4. p. 225 | 17. p. 234 |
| 5. p. 225 | 18. pp. 234-236 |
| 6. pp. 225-226 | 19. pp. 236-237 |
| 7. pp. 225-226 | 20. pp. 236-239 |
| 8. p. 227 | 21. p. 239 |
| 9. p. 227 | 22. p. 240 |
| 10. pp. 227-228 | 23. p. 240 |
| 11. pp. 228-229 | 24. pp. 240-241 |
| 12. pp. 228-229 | 25. p. 241 |
| 13. pp. 229-230 | |

APPENDIX TO CHAPTER 11

Additional Game Theory Applications

This appendix provides some additional applications of oligopoly based on game theory and behavior. The first section of the appendix discusses strategies and equilibrium for games that occur just one time between two rivals. Here you will learn about the **Nash equilibrium**, which is an outcome from which neither rival wants to deviate because each firm sees its strategy as optimal given the strategy of its rival. The second section introduces the ideas of a **credible threat** and an **empty threat** and evaluates how each will affect Nash equilibrium. The third section turns to **repeated games**, which are games played more than once, and explains how strategies are influenced by the thought that there will be reciprocity from a rival, or less direct or intense competition. The final section turns to the topic of **sequential games**, in which the outcome depends on **first-mover advantage** and the ability to preclude entry by rivals.

■ CHECKLIST

When you have studied this appendix you should be able to

- ☐ Describe a one-time game and simultaneous game.
- ☐ Define positive-sum game, zero-sum game, and negative-sum game.
- ☐ Give an example of a dominant strategy in a game.
- ☐ Define the Nash equilibrium for a one-time game.
- ☐ Explain how a credible threat affects the Nash equilibrium.
- ☐ Explain how an empty threat affects the Nash equilibrium.
- ☐ Describe a repeated game and the effect of a reciprocity strategy on game outcomes.
- ☐ Supply an example of a sequential game.
- ☐ Explain how first-mover advantages in a sequential game affect decisions by rivals and entry into markets.

■ APPENDIX OUTLINE

1. In a **one-time game**, two firms (rivals) select their optimal strategies in a single time period without considering subsequent time periods. If both firms make their strategies at the same time, it is also a **simultaneous game**.

a. If the net outcome from such one-time and simultaneous games is positive, it is a **positive-sum game**. If the net outcome is negative, it is a **negative-sum game**. If the net outcome is zero, it is a **zero-sum game**.

b. If one option in a game is better for a firm than any alternative option in a game regardless of the choice made by another firm, the better option is a **dominant strategy**. Not all games have a dominant strategy, however.

c. The dominant strategy for each firm determines the game's **Nash equilibrium**. It is the outcome from which neither firm wants to deviate because it is optimal given the strategic choice made by the other firm.

2. If there is a **credible threat** in a single-period and simultaneous game, then it can cause the firms to abandon the Nash equilibrium. The credible threat can occur if one firm is believed to have the power to dictate the decision of another firm and thus the firms collude. It is, however, difficult to enforce such a threat and if it is not credible, it is an **empty threat**. In this case, the Nash equilibrium will hold.

3. A **repeated game** is not a one-time event, but occurs more often or somewhat regularly. In this situation, the optimal strategy for a firm may be to limit competition with the other firm, if the other firm reciprocates by limiting its competition. Thus reciprocity strategies, and whether they will be used, are important for determining outcomes in repeated games.

4. A sequential game is one in which the final outcome may depend on which firm makes the first move because the first-mover may be able to establish the Nash equilibrium. A real-world example would be a large store such as Wal-Mart that, by making a first-mover decision to enter a market, prevents other large firms from also entering the same market because it would not be profitable.

■ HINTS AND TIPS

1. This appendix extends your understanding of game theory and strategic behavior described in Chapter 11. Before you start the appendix, make sure you master how the profit-payoff matrix works for two-firm oligopolies

as in the example shown in Figure 11.3. A similar matrix is used to illustrate each two-firm game discussed in this appendix.

2. There is nothing complicated about the content of this appendix, but it does introduce subtle distinctions in the definitions and conditions for games that you will need to learn as shown in the following list of important terms.

■ IMPORTANT TERMS

Nash equilibrium	one-time games
credible threat	simultaneous games
empty threat	positive-sum games
repeated games	zero-sum games
sequential games	negative-sum games
first-mover advantage	dominant strategy

SELF-TEST

■ FILL-IN QUESTIONS

1. If firms select their optimal strategies in a single time period, it is a (one-time, repeated) _____ game, but if firms select their optimal strategies based on a situation that is recurring, it is a _____ game.
2. Outcomes from games can be used to categorize games: if there is an "I win and you lose" outcome, it is a (positive, zero, negative) _____-sum game; if there is a "win-win" outcome, it is a _____-sum game; and, if there is a "lose-lose" outcome, it is a _____-sum game.
3. A strategic choice for a firm that is better than any other option is a (subordinate, dominant) _____ strategy.
4. In a two-firm game, the dominant strategy for each firm determines the (Crawe, Nash) _____ equilibrium.
5. At such an equilibrium, both firms consider their current strategy as optimal and (do, do not) _____ want to deviate from it; so such an equilibrium is (stable, unstable) _____.
6. If a firm is capable or likely to use coercion to force a desired decision on a rival firm, the threat is (credible, empty) _____, but if the firm cannot use coercion to force a desired decision, the threat is _____.
7. If a threat is credible, firms will (deviate, not deviate) _____ from the Nash equilibrium and seek

greater profits, but if a threat is empty, threatening firms will _____ from the Nash equilibrium and be unable to seek greater profits.

8. In a repeated game, if one firm avoids taking advantage of another firm because the firm knows the other firm will take advantage of it in a subsequent game, then there is likely to be a (monopolistic, reciprocity) _____ strategy enacted by the firms that can (harm, improve) _____ the outcomes from such games.

9. If one firm moves first and commits to a strategy and the other firm must then respond, it is a (repeated, sequential) _____ game.

10. In a sequential game involving two large, but similar retailers, the first-move retailer may have the opportunity to (establish, destroy) _____ a Nash equilibrium and it may make it (profitable, unprofitable) _____ for the other retailer to enter the market.

■ TRUE-FALSE QUESTIONS

Circle *T* if the statement is true, *F* if it is false.

1. Games can either be one-time games or repeated games. T F
2. Negative-sum games feature an "I win and you lose" outcome. T F
3. Decisions in games may be made simultaneously, but not sequentially. T F
4. When two firms are playing a strategic game, a firm has a dominant strategy if one option leads to a better result than all other options no matter what the other firm does. T F
5. The Nash equilibrium is an outcome from which neither firm wants to deviate because both firms see their current strategy is optimal given the selected strategy of the other firm. T F
6. A Nash equilibrium is unstable and changing. T F
7. An empty threat in a two-firm game will change outcomes and the Nash equilibrium. T F
8. Reciprocity means that one firm avoids taking advantage of the other firm because it knows that the other firm can take advantage of it in subsequent games. T F
9. Reciprocity makes outcomes worse for firms participating in repeated games. T F
10. If there is a first-mover advantage for two rival firms seeking to enter a market, it may be possible for the first-mover firm to preempt entry by the other firm. T F

■ MULTIPLE-CHOICE QUESTIONS

Circle the letter that corresponds to the best answer.

1. If one firm's gain equals another firm's loss it is a
 (a) negative-sum game
 (b) zero-sum game
 (c) repeated game
 (d) sequential game

Questions 2, 3, and 4 are based on the following payoff matrix for a single-period, two-firm game for firms **Rig** and **Dig**. The numbers in the matrix indicate the profit in millions of dollars for a national or regional strategy. The profit outcome cells are **A**, **B**, **C**, and **D**.

		Rig Strategy	
		National	Regional
Dig Strategy	National	(A) Rig = \$24 Dig = \$24	(B) Rig = \$12 Dig = \$42
	Regional	(C) Rig = \$42 Dig = \$12	(D) Rig = \$36 Dig = \$36

2. Which strategies are the dominant ones for Rig and Dig?

- (a) national for Rig and regional for Dig
 (b) regional for Rig and national for Dig
 (c) national for Rig and national for Dig
 (d) regional for Rig and regional for Dig

3. The Nash equilibrium will be represented by which cell showing the set of profit outcomes for the two firms?

- (a) A
 (b) B
 (c) C
 (d) D

4. If Dig can make a credible threat that determines the strategy for Rig, then which combinations of strategies will be selected?

- (a) national for Rig and regional for Dig
 (b) regional for Rig and national for Dig
 (c) national for Rig and national for Dig
 (d) regional for Rig and regional for Dig

5. If Dig makes a threat, but it is an empty threat that is not believable for Rig, then which cell shows the set of profit outcomes for the two firms?

- (a) A
 (b) B
 (c) C
 (d) D

6. In a repeated game among two firms, if the optimal strategy for one firm is to cooperate with the other firm and restrain competition in the expectation that the other firm will do the same, then the firm is using a

- (a) dominant strategy
 (b) reciprocity strategy
 (c) credible threat strategy
 (d) empty threat strategy

7. If one firm make the first move and then the other firm responds, it would be a

- (a) zero-sum game
 (b) negative-sum game
 (c) simultaneous game
 (d) sequential game

Questions 8, 9, and 10 are based on the following payoff matrix for a single-period, two-firm game for the two major aircraft makers, **Fly** and **Sky**. The numbers in the matrix indicate the profit in billions of dollars if a firm builds or does not build a new aircraft to compete with the other firm. The profit outcome cells are **A**, **B**, **C**, and **D**.

		Fly Strategy	
		Build	Don't build
Sky Strategy	Build	(A) Fly = -\$12 Sky = -\$12	(B) Fly = \$ 0 Sky = \$15
	Don't build	(C) Fly = \$15 Sky = \$ 0	(D) Fly = \$ 0 Sky = \$ 0

8. What will be the total amount of profit or losses for both firms if both firms decide simultaneously to build a new aircraft?

- (a) \$0
 (b) \$15 billion
 (c) -\$12 million
 (d) -\$24 million

9. Which pair of cells contains the possible Nash equilibrium?

- (a) A and B
 (b) B and C
 (c) C and D
 (d) A and D

10. If Sky makes the first move and builds an aircraft then

- (a) Sky will earn \$15 billion and Fly will earn \$0
 (b) Sky will lose \$12 billion and Fly will lose \$12 billion
 (c) Sky will earn \$15 billion and Fly will earn \$15 billion
 (d) Neither firm will make a profit, but neither firm will suffer a loss

■ PROBLEMS

For problems 1 to 4 use the following payoff matrix for two retail firms, **Top** and **Pop**, in a single-period, one-time game. The numbers in each cell (**A**, **B**, **C**, or **D**) indicate the profit in millions of dollars based on whether they adopt a high-price or a low-price strategy.

		Top Strategy	
		High-price	Low-price
Pop Strategy	High-price	(A) Top = \$30 Pop = \$30	(B) Top = \$15 Pop = \$60
	Low-price	(C) Top = \$60 Pop = \$15	(D) Top = \$45 Pop = \$45

- Determine the dominant strategy for Pop.
 - If Top adopts a high-price strategy, then Pop will be better off if it chooses a high-price strategy because it can earn \$ _____ million. By contrast, if Pop had used a low-price strategy in this case, it only would earn \$ _____ million in profit.
 - If Top adopts a low-price strategy, then Pop will be better off if it chooses a high-price strategy because it can earn \$ _____ million. By contrast, if Pop used a low-price strategy in this case, it only would earn \$ _____ million in profit.
 - Regardless of whether Top adopts a high-price or low-price strategy, Pop will be better off if it adopts a high-price strategy because it can earn either \$ _____ million or \$ _____ million. A high-price strategy is the dominant strategy for Pop.
- Determine the dominant strategy for Top.
 - If Pop adopts a high-price strategy, then Top will be better off if it chooses a high-price strategy because it can earn \$ _____ million. By contrast, if Top used a low-price strategy in this case, it only would earn \$ _____ million in profit.
 - If Pop adopts a low-price strategy, then Top will still be better off if it chooses a high-price strategy because it can earn \$ _____ million. By contrast, if Top used a low-price strategy in this case, it only would earn \$ _____ million in profit.
 - Regardless of whether Pop adopts a high-price or low-price strategy, Top will be better off if it adopts a high-price strategy because it can earn either \$ _____ million or \$ _____ million. A high-price strategy is the dominant strategy for Top.
- Identify the Nash equilibrium.
 - Each firm will adopt a _____-price strategy because such a strategy is dominant over all other choices for each firm. The Nash equilibrium will be in cell _____.
 - At the Nash equilibrium each firm will earn \$ _____ million.
- Identify the effects of credible and empty threats.
 - If Pop chooses a low-price strategy and makes a credible threat to get Top to adopt a low-price strategy,

then both firms will abandon the Nash equilibrium at cell _____ and move to cell _____ in the profit-payoff matrix. Pop will earn a profit of \$ _____ million.

b. If Pop chooses a low-price strategy and makes a threat to get Top to adopt a low-price strategy, but Pop cannot enforce that threat or it is not believable, then the Nash equilibrium will be at cell _____.

The profit for each firm will be \$ _____.

- Determine outcomes from repeated games and reciprocity. Use the following payoff matrix for two shoe firms, **Skip** and **Jump**, who are involved in a two-period game. The numbers in each cell (A, B, C, or D) indicate the profit in millions of dollars based on whether they adopt more advertising or less advertising for the introduction of a new shoe. Assume that in period 1, Jump introduces a new shoe, Clog, and it adopts an advertising strategy of placing more ads to sell the new shoe.

Period 1: Jump introduces a new shoe, Clog

		Skip Strategy	
		More-ads	Fewer-ads
Jump Strategy	More-ads	(A) Skip = \$20 Jump = \$20	(B) Skip = \$16 Jump = \$32
	Fewer-ads	(C) Skip = \$32 Jump = \$16	(D) Skip = \$24 Jump = \$24

- If, in response, Skip counters by placing more ads, the amount of profit for each firm will be \$ _____ million. The profit outcomes for both firms will be at cell _____.
- But if, in response, Skip adopts a fewer-ads strategy in hopes that Jump will do the same when Skip launches its new shoe, then Skip will earn \$ _____ million in profit. The profit outcomes for both firms will be at cell _____.

Now assume that in period 2 Skip launches its new shoe, Fleet, and adopts a more-ads strategy.

Period 2: Skip introduces a new shoe, Fleet

		Skip Strategy	
		More-ads	Fewer-ads
Jump Strategy	More-ads	(A) Skip = \$22 Jump = \$22	(B) Skip = \$20 Jump = \$28
	Fewer-ads	(C) Skip = \$30 Jump = \$20	(D) Skip = \$28 Jump = \$26

- c. If, in response, Jump counters by placing more ads, the amount of profit earned by each firm will be \$_____ million. The profit outcomes for both firms will be at cell _____.
- d. But if, in response, Jump cooperates and adopts a reciprocity strategy of fewer ads, Jump will earn \$_____ million. The profit outcomes for both firms will be at cell _____.
- e. By cooperating and showing reciprocity to each other, the firms will earn more total profit. In period 1, Jump will earn \$_____ million and in period 2 Jump will earn \$_____ million, for a total of \$_____ million. In period 1, Skip will earn \$_____ million and in period 2 Skip will earn \$_____ million for a total of \$_____ million.
- f. Had there been no cooperation or reciprocity, each firm would have earned \$_____ million in the first period and \$_____ million in the second period, for a total of \$_____ million.

■ SHORT ANSWER AND ESSAY QUESTIONS

1. What are the differences between positive-sum, negative-sum, and zero-sum games?
2. How can decisions in games be either simultaneous or sequential? Give examples of each type.
3. Explain what is meant by a dominant strategy in a one-period game involving two rival firms.
4. Define the Nash equilibrium. Is it stable or unstable?
5. How does the use of credible threats or empty threats from firms affect outcomes and the Nash equilibrium in one-period games?
6. Give examples of real-world companies for which repeated games apply.
7. What strategies might two dominant firms use in repeated games to increase profits over what might be achieved with competitive strategies?
8. Explain how the first mover might have an advantage in a sequential game. Does such an advantage always produce a positive outcome?
9. Why might there be two outcomes that could create the Nash equilibrium in sequential games with first-mover advantages?
10. Supply some real-world examples of firms that have used first-mover advantages to saturate markets or pre-empt entry by rivals.

ANSWERS

Appendix to Chapter 11: Additional Game Theory Applications

FILL-IN QUESTIONS

1. one-time, repeated
2. zero, positive, negative
3. dominant
4. Nash
5. do not, stable
6. credible, empty
7. deviate, not deviate
8. reciprocity, improve
9. sequential
10. establish, unprofitable

TRUE-FALSE QUESTIONS

- | | |
|--------------------|--------------------|
| 1. T, pp. 246–247 | 6. F, p. 246 |
| 2. F, p. 246 | 7. F, p. 247 |
| 3. F, pp. 246, 248 | 8. T, p. 247 |
| 4. T, p. 246 | 9. F, p. 248 |
| 5. T, p. 246 | 10. T, pp. 248–249 |

MULTIPLE-CHOICE QUESTIONS

- | | |
|-------------------|--------------------|
| 1. b, p. 246 | 6. b, p. 247 |
| 2. c, p. 246 | 7. d, p. 248 |
| 3. a, p. 246 | 8. d, pp. 248–249 |
| 4. d, pp. 246–247 | 9. b, pp. 248–249 |
| 5. a, p. 247 | 10. a, pp. 248–249 |

PROBLEMS

1. a. 30, 15; b. 60, 45; c. 30, 60
2. a. 30, 15; b. 60, 45; c. 30, 60
3. a. high, A; b. 30
4. a. A, D, 45; b. A, 30
5. a. 20, A; b. 16, B; c. 22, A; d. 20, C; e. 32, 20, 52, 16, 46, 46; f. 20, 22, 42

SHORT ANSWER AND ESSAY QUESTIONS

- | | |
|-----------------|----------------|
| 1. p. 247 | 6. p. 247 |
| 2. pp. 247, 249 | 7. p. 248 |
| 3. p. 247 | 8. pp. 248–249 |
| 4. p. 247 | 9. p. 249 |
| 5. pp. 247–248 | 10. p. 249 |

